REPORT NO. 80-2-3

3430
OCTOBER 1979

BIOLOGICAL EVALUATION OF THE SOUTHERN PINE BEETLE ON THE HOMOCHITTO NATIONAL FOREST IN MISSISSIPPI

by

Michael D. Connor[1/]

A biological evaluation was conducted on the Homochitto National Forest the week of September 11-15, 1979. The purpose of the evaluation was to determine the current status of southern pine beetle, Dendroctonus frontalis Zimmerman, populations on the forest and to determine what action, if any, would be necessary in FY 80.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATION

Aerial Survey and Ground Checks

Standard aerial sketch map procedures were used for this evaluation, except that survey coverage was 100 percent.[2/] The survey was made by district personnel and spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps. On the Homochitto district, 10 percent (or a minimum of 10 spots) were selected for ground checking using a stratified random sampling scheme. Spots were stratified by size class (1-25, 26-50, 51-75, > 76 trees, aerial observation) and a representative proportion of spots from each size class were ground checked. On the Bude District, spots were classified as 1 tree, 3 to 20 trees, or > 40 trees. Only four spots were sampled on the Bude District due to the high proportion of single tree spots.

Numbers of vacated and infested trees, basal area, and age were recorded in the ground check. Bark samples for attack:emergence analysis were collected.[3/]

1/ Entomologist, USDA, Forest Service, Southeastern Area, State and Private Forestry, Pineville, La.

2/ Detection of Forest Pests in the Southeast, 1970. USDA, Forest Service, Southeastern Area, State and Private Forestry, Publ. S&PF-7, Atlanta, Ga. 51 pp.

3/ Moore, Gordon E. 1977. Factors for determining trends in southern pine beetle spots. J. Environ. Entomol. Vol. 7, No. 3, pp. 335-341.

Attack:Emergence Evaluation

The attack:emergence analysis procedure for estimating subsequent tree mortality from SPB infestations was adapted as a predictive tool.[4/] [5/] This procedure predicts future spot growth based on the ratio of southern pine beetles entering the trees to the number of beetles emerging (this is both attacking adults and developed brood). For purposes of this evaluation, the procedure will be referred to as the attack:emergence ratio. A prediction of SPB increase would require an attack:emergence ratio of 1:10 or greater. Attack:emergence ratios for spots predicted to remain static in growth would be 1:5 - 1:9.9. A decreasing population would have an attack:emergence less than or equal to 1:4.9. This procedure has been proven on a spot basis for a 2-year-period in North Carolina.[6/]

This evaluation assumes that spot growth as predicted by the attack:emergence bark sample analysis is indicative of SPB population growth on the forest on an area basis. For example, if attack:emergence ratios predict increased populations within the sample spots, then the assumption would be that an increased amount of volume will be lost (or an increased number of trees will be killed) by SPB areawide on that district.

Volume Protected Determination

The volume which would be protected by having a suppression project was estimated by use of spot growth formulae. Spot growth formulae estimate the amount a spot would grow if not salvaged. The difference between salvage volume and the size the spot would have grown if left alone is the volume protected.[7/]

RESULTS

Aerial Survey and Ground Checks

A total of 52 SPB spots were found on the Homochitto District ranging from 5 - 150 trees. Thirty-eight spots were in the 1 - 25 tree class, 5 in the 26 - 50 class, 5 in the 51 - 75 class, and 4 in the > 75 class. Ten spots were ground checked. Ground check data and attack:emergence bark analysis data are summarized in table 1.

A total of 59 SPB spots were found on the Bude District ranging from 1 tree to > 40 trees. Thirty-nine spots had only 1 tree, 16 had from 3 - 20 trees, and 4 had > 40 trees. Only four spots were ground checked due to the high proportion of single tree spots. Ground check data and attack:emergence bark analysis data are summarized in table 2.

4/ Moore, Op. Cit.

5/ This methodology is being used on a trial basis. Further analysis and evaluation must be made before further use.

6/ Moore, Op. Cit.

7/ Hedden, R. L. 1979. Southern pine beetle spot growth inactivity in East Texas. Forest Sci. In press.

Table 1. Summary of ground check data and attack:emergence bark analysis data for Homochitto Ranger District, Homochitto National Forest, Miss., September 1979.

Aerial Size	Total No. Trees	No. Infested Trees			No. Vacated Trees		Attack:Emergence Ratio	Red:Green[a/] Ratio
		Total	Green	Reds & Faders	Total	Reds & Faders		
8	5	1	0	1	4	3	[b/]	1:0
10	19	9	4	5	10	7	1:14.0	1:0.8
0	8	7	6	1	1	1	1:3.5	1:6.0
15	17	4	4	0	13	2	1:9.1	1:4.0
20	57	41	39	2	16	12	1:9.1	1:19.5
25	48	34	31	3	14	0	1:2.4	1:10.3
30	47	8	3	5	39	26	1:11.0	1:0.60
70	88	39	31	8	49	21	1:6.8	1:3.8
100	169	90	82	8	79	23	1:9.1	1:4.0
[c/]	169	93	77	16	76	42	1:13.9	1:4.8
							$\bar{x}$ = 1:8.8	$\bar{x}$ = 6:0

a/ Based on numbers of infested reds and faders compared to numbers of green infested trees. Average R:G=1:6.0; that is, an average of 6.0 infested green trees is present for each infested red and fading tree in the sample spots.

b/ No attack:emergence ratio is calculated for inactive spots because of methodology recommended by G. E. Moore (see footnote 3 in text).

c/ No aerial size data was available for this spot.

Table 2. Summary of ground check data and attack:emergence bark analysis data for Bude Ranger District, Homochitto National Forest, Miss., September 1979.

Total No. Trees	No. Infested Trees			No. Vacated Trees		Attack:Emergence	Red:Green[a/]
	Total	Green	Reds & Faders	Total	Reds & Faders		
1	0	0	0	1	1	[b/]	1:0
10	0	0	0	10	7	[b/]	1:0
87	30	26	4	57	20	1:9.6	1:6.5
147	106	82	24	41	17	1:15.4	1:3.4
						$\bar{x}$ = 1:12.5	$\bar{x}$ = 1:2.5

a/ Based on numbers of infested reds and faders compared to numbers of green infested trees. Average R:G 1:2.5; that is an average of 2.5 green grees is present for each infested red or fading tree in the sample spots.

b/ No attack:emergence ratio is calculated for inactive spots because of methodology recommended by G. E. Moore (see footnote 3 in text).

Attack:Emergence Evaluation

The average attack:emergence ratio for the Homochitto District was found to be static-increasing (A:E - 1:8.8). Based on the attack: emergence procedure, FY 80 losses should be from 1.0 - 1.5 times the loss experienced in FY 79. Since the basal areas ranged from 110-180, and the infested red:green tree ratio averaged 1:6 for the district (table 1), an increasing condition of 1.5 was considered the best prediction for FY 80 losses. Thus, FY 80 mortality should be one and one-half times greater than the mortality sustained in FY 79.

The attack:emergence ratio was found to indicate increasing SPB populations on the Bude District (A:E - 1:12.5). Therefore, FY 80 losses should be at least 1.5 times the FY 79 loss.

Volume Protected Determination

Total volume protected as derived from Hedden's spot growth formula was found to be 440 MBF on the Homochitto District.

DISCUSSION AND RECOMMENDATIONS

The Homochitto District is experiencing large timber losses from SPB. At this time, the Bude District does not have extensive timber mortality from SPB. However, due to the high attack:emergence ratio and the infested red:green tree ratio on the Bude District (table 2), a high potential for SPB loss exists. Therefore, SPB suppression activities should continue on the two districts of this forest.

It is recommended the Bude District receive aerial surveillance and that district personnel be alert for SPB activity while conducting other field activities.

For both districts, a salvage control action will minimize losses and prevent spot growth by removing infested material from the forest. Chemical suppression and/or cut-and-leave tactics are recommended only for inaccessible spots or for small spots that cannot be administered any other way. Forest Insect and Disease Management, Pineville, La., should be contacted prior to the extensive use of chemical control for an update on latest restrictions or application procedures. If cut-and-leave is to be used, district personnel should plan a training session with FI&DM before the summer season (summer is the only time this method is recommended for use). All suppression activity should be done in accordance with the 3400 section, FSM, and the project control plan for the forest.

Predicting future timber mortality is difficult due to the occurrence of overlapping generations of beetles each year. The attack:emergence

technique used for this evaluation predicts a mortality trend. This prediction technique has been proven accurate on a spot basis, but work continues to adapt these predictions to an area basis. For purposes of this evaluation, assumptions are that spot sizes and distribution within each age class of timber will remain the same.

While direct suppression activities are necessary, it is also possible to reduce future losses through preventative measures. Maintaining healthy, thrifty stands is one of the better ways to prevent SPB losses.

Here are stand conditions the prescriptionist should look for to reduce SPB losses:

1. Avoid basal areas in excess of 120 sq ft/ac. Older, dense stands should be thinned as heavily as R-8 guides allow.

2. Make sure species are matched to site.

3. Note presence of littleaf or annosus root rot sites. These sites have been shown to be problem SPB areas.

4. Plan for as little disturbance as possible when these stands are thinned. Damaged stands are more susceptible to bark beetle attack.

A vigorous SPB population capable of causing increased losses in FY 80 is present on the Homochitto District. A high potential for SPB losses exists on the Bude District. It is important that suppression action be taken to minimize timber loss and to stop spot growth in the larger spots.

Because of expected SPB activity, the forest needs to plan enough technician time to implement the work required to meet project objectives.

For further information, contact Forest Insect and Disease Management Pineville Field Office, Pineville, La. 71360 (Phone FTS 497-3311, or Commercial 318-445-6511, Ext. 311).